#### WHAT IS CLAIMED IS:

1. A sensor comprising:

an insulating jacket having a hole that longitudinally extends

through a portion of the insulating jacket; and
an outer metal shell that fits around and contacts the insulating jacket.

- 2. The sensor of claim 1 and further comprising an imaging structure located in the hole.
  - 3. The sensor of claim 2 wherein the imaging structure includes:

an imager that collects photon information; and
a plurality of wires that carry the photon information and extend
out of the hole.

4. The sensor of claim 2 wherein the imaging structure includes:

an imager that collects photon information;

a wiring substrate connected to the imager;

a plurality of wires connected to the wiring substrate that carry photon information and extend out of the hole; and

a rigid structure that contacts the wiring substrate.

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- 5. The sensor of claim 3 wherein the imager includes a color imaging cell.
- 6. The sensor of claim 5 wherein the color imaging cell includes a vertical color imaging cell.

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- 7. The sensor of claim 3 wherein the imager includes a black and white imaging cell.
- 5 8. The sensor of claim 2 wherein the insulating jacket further includes a channel that longitudinally extends through the insulating jacket.
- The sensor of claim 3 and further comprising a conductive
   electrode having a first end and a spaced apart second end located in the channel, and

wherein the outer metal shell has a tip that curves up and around to be directly over the first end of the conductive center electrode such that a tip end of the tip is spaced apart from the first end of the conductive center electrode by a gap.

- 10. The sensor of claim 2 wherein the hole has an L-shape.
- 11. The sensor of claim 2 wherein the hole is substantially20 straight, and has an end region and a middle region that is wider than the end region.
- 12. The sensor of claim 9 wherein the hole has an L-shape and an opening lies adjacent to the first end of the conductive center25 electrode.
  - 13. The sensor of claim 9 wherein the hole has a first opening and a spaced apart second opening that lie on opposite sides of an engine wall.

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14. A method of optimizing the combustion in an internal combustion engine, the internal combustion engine having a combustion chamber and a sensor that extends into the combustion chamber, the method comprising the steps of:

detecting a light emitted inside the combustion chamber with the sensor; and

altering the operation of the internal combustion engine in response to the light.

## 15. The method of claim 14 wherein:

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the light includes burned light that results from burning a substance in the combustion chamber of the engine, the substance having a plurality of components, the plurality of components having relative concentrations; and

the altering step includes altering the relative concentrations of the components in response to the burned light.

### 16. The method of claim 15 wherein:

the light includes spark light that results from a spark extending across a gap of a spark plug; and

the altering step includes altering a timing of the spark across the gap in response to the spark light.

#### 17. The method of claim 15 wherein:

25 the light includes spark light that results from a spark extending across a gap of a spark plug; and

the altering step includes altering a waveform of the spark in response to the light detected from the spark.

## 18. The method of claim 14 wherein:

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#### **PATENT**

the light includes spark light that results from a spark extending across a gap of a spark plug; and

the altering step includes altering a timing of the spark across the gap in response to the spark light.

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# 19. The method of claim 18 wherein:

the light includes spark light that results from a spark extending across the gap; and

the altering step includes altering a waveform of the spark in response to the light detected from the spark.

20. The method of claim 14 wherein the altering step includes altering a value timing in response to the light.

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